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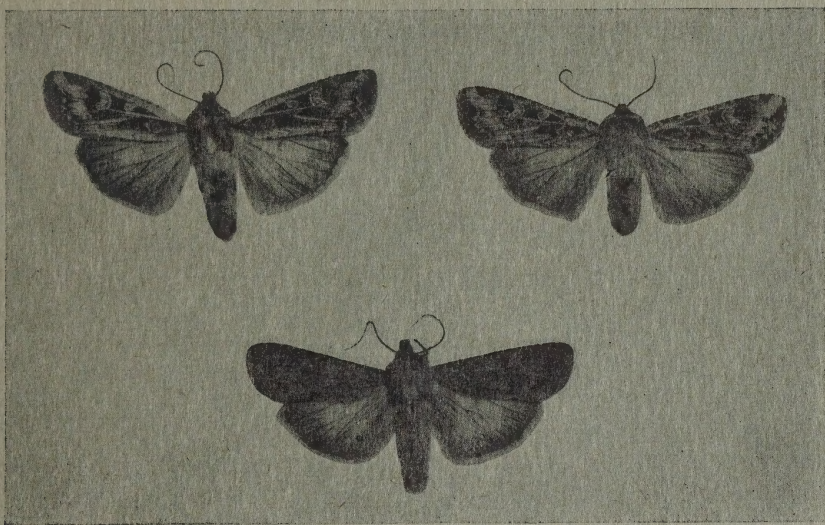
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# THE ARMY CUTWORM

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The Three Varieties of Army Cutworm Moths (after Strickland).

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## SUMMARY

The army cutworm is the caterpillar of a moth or "miller" and is a native of the eastern Rocky Mountain region.

The cutworms feed above ground and when food is scarce they migrate as an "army" to nearby vegetation.

The eggs hatch in the autumn within a few weeks after being laid and the cutworms are about half grown when winter sets in. They begin feeding as soon as plant growth is well started in the spring and reach maturity in May.

Outbreaks are apparently caused by unusual weather conditions. The sudden appearance of enormous numbers of cutworms finds the farmers unprepared, and serious losses occur before control measures can be put into effect.

It is possible to forecast an outbreak by studying weather conditions from July 1 to November 1. A dry July followed by a wet autumn usually means an outbreak the next spring.

The army cutworm can be controlled by the use of poisoned bait and trap furrows.

As soon as a crop has been destroyed by the army cutworms, they leave the field in search of more food, and when this occurs it is safe to reseed at once.



# THE ARMY CUTWORM

By H. L. SEAMANS, *Entomologist, Entomological Laboratory,  
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The army cutworm (*Chorizagrotis auxiliaris* Grote) is a native of the Rocky Mountain region. It first appeared in outbreak numbers in 1898, when a heavy infestation was reported from western Montana. In 1903, it was present generally over the extreme western prairies, including Alberta, where there was some injury in gardens. Occasional sudden outbreaks have occurred since. Some of these have been very local and others have spread over many hundreds of square miles. During the season of 1915, there was a heavy infestation covering a large part of southern Alberta and the state of Montana. This was followed by a scarcity of the insect in Alberta until a small local outbreak appeared in 1925. The numbers increased during the next two seasons and a heavy infestation was present throughout the southern part of the province.

## HOW TO RECOGNIZE THE ARMY CUTWORM

The army cutworm is a hairless caterpillar and when full grown is about one and one-half inches long. The colour varies from brown to grayish-green. The commonest form has a brownish back with a fine, white, longitudinal line running down the centre with a similar line on each side. The sides of the body are brownish-green with one or two light longitudinal lines and the underside is of a uniform grayish-green colour.

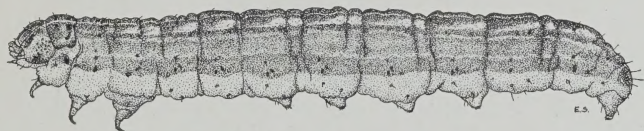


Fig. 1.—Full grown army cutworm. Twice natural size  
(after Strickland).

The small cutworms are of varying shades of brown with distinct, light, longitudinal lines on the back and sides. The brown colour becomes darker until the cutworms are half an inch long, after which, as growth continues, the green colouration becomes more pronounced.

All stages of this insect live in the soil and feed on growing vegetation. When food is scarce the cutworms migrate in mass or "army" formation in the direction of the nearest food plants. It is this habit which gives the insect its common name and distinguishes it from the majority of the cutworms of the west.

The migrations usually take place in the late afternoon and continue until the cool night temperature causes the cutworms to enter the soil for protection. There may be some activity and slight migration early in the morning, but if the sun is bright and hot the cutworms remain below the soil surface, unless they are very hungry. However, if the weather is cool and cloudy the migrating and feeding may continue throughout the day.

The adult stage of the caterpillar is a moth or "miller" about three-quarters of an inch long. It varies in colour from gray to brown, with or without distinct markings of other colours. The moths begin to fly soon after the first of June and though they are harmless they often become a nuisance because of their habit of working their way into dwellings and other buildings.

## LIFE-HISTORY

The moths begin to appear early in June and may be observed until about July 1. They usually fly at night or during cool afternoons and hide whenever the sun is bright and hot. Artificial light will attract them for short distances at night when they may be found clustered on the outside of screens and windows of a lighted room or fluttering around the light itself.

As the season becomes warmer the moths seek protection from the heat. In the field they crawl under clods, heavy weeds or rubbish, but hundreds of them fly to buildings where they crawl into cracks and crevices. Some work their way into the buildings where they remain the entire summer and fall. When the weather becomes cooler the moths resume activity and lay their eggs during September and even later. Each female may lay about 1,000 eggs. As with other cutworm moths, the eggs are laid in the soil irrespective of the presence of vegetation. Freshly worked or dusty soil is preferred to that which is packed or crusted.

The eggs are as small as fine sand and when freshly laid are pearly white. They appear to be smooth but actually have fine markings which are only visible when highly magnified. As incubation proceeds the eggs become darker and in about two weeks are grayish-brown and ready to hatch. If moisture is present at this time the eggs hatch at once. If the eggs are kept dry, however, they will retain their ability to hatch for two months. The cutworms which hatch from the dry eggs, however, are very small and weak.



Fig. 2.—Earthen cell in which the cutworm pupates; natural size (after Strickland).

During late September and October, the tiny, newly hatched cutworms require abundant moisture to keep them alive. For the first eight or ten days they can live on moisture alone and in the field they feed on any material which will supply such moisture. If the soil is too dry to furnish moisture, they feed on the small rootlets or wet, rotting straw. In about two weeks they begin to feed on growing vegetation. The moisture conditions which hatch the eggs and keep the very young cutworms alive are usually ideal for starting fall plant growth so that they seldom have to move far to secure sufficient food.

The cutworms continue to feed and grow until cold weather sets in, when they become inactive and live in the top inch of the soil. A period of warm weather in the middle of winter may start some activity but feeding is seldom resumed before spring. Extreme cold appears to have no effect on the cutworms, as they survive exposure to temperatures below zero which are lower than that ordinarily found in the soil.

Cutworm activity begins again when spring temperatures have reached a point where plant growth is well started. At this time the caterpillars are of various sizes and the period of inactivity is followed by feeding and very rapid



development. The rate of growth is not uniform in the spring and the smaller ones develop faster than those that are more mature, with the result that the caterpillars are of fairly uniform size when migration starts.

About the end of April the cutworms are full grown. They then cease feeding, burrow into the soil to a depth of two or three inches and begin to form a cell made by cementing together particles of soil. During the next ten days the cell is completed and they then shrink, becoming lighter in colour and finally change to a brown pupa (chrysalis). The pupal stage lasts two or three weeks, after which the moths emerge.

### CAUSES OF OUTBREAKS

Outbreaks of the army cutworm occur without any warning. There is no gradual increase over a period of years nor is the abundance of moths in any one season an indication of the numbers of cutworms which may be present the following year. Both moths and caterpillars are to be found every year but the outbreaks are rare and seldom occur two years in succession.

A study of recent outbreaks has shown that weather conditions are probably the governing factors. The scarcity of outbreaks in Alberta is due to the fact that the average season is not favourable for increase and it is only a very unusual summer that is followed by a heavy infestation. Seasons of this type occurred in 1925 and 1926 and widespread outbreaks were present in Alberta two seasons in succession.

The study of weather records for the Rocky Mountain region show July, on the average, to be one of the three wettest months of the year, followed by a dry autumn. No season conforms strictly to the average and occasionally July is very dry and the three following months unusually wet. Such seasons usually have been followed by an outbreak of the army cutworm.

When the moths go into hiding to escape from the heat during July, they are sluggish. The heavy showers which constitute the average July rainfall drown many of the hiding moths, while others are trapped under clods by the dirt which is washed down. The few survivors deposit their eggs as usual but the average dry autumn does not allow a high percentage of these eggs to hatch, nor is there sufficient moisture to allow the majority of the very young cutworms to develop. When the weather conditions are reversed, the dry weather of July has little effect on the hiding moths and most of the females survive to lay their eggs. The wet fall is ideal for hatching these eggs and also brings the very young cutworms through their critical period with every chance of a marked increase the next spring.

### NATURAL CONTROL

The general weather conditions of the prairies are probably the most important agency in the natural control of this insect. In addition, there are two classes of enemies which are of some value in control, namely, parasites and predators. Parasites are insects or diseases which live either in or on the cutworms and eventually kill them. Predators are insects or animals which directly attack and eat the cutworms.

There are various ways in which cutworms may become parasitized by other insects. Some parasites deposit their eggs on vegetation. These are taken into the body along with the food and hatch on coming in contact with the digestive juices. Other parasites deposit their eggs on the cutworm. When these eggs hatch, the young parasites either remain where they are and feed through a small opening in the skin or work their way inside the cutworm's body and remain there until mature. A third type of parasite forces its eggs

inside the cutworm's body. In all cases of insect parasites, a single egg gives rise to a larva which eventually destroys an individual cutworm even though the cutworm may appear and act normally in every way.

Two diseases of the army cutworm are caused by parasitic fungi or bacteria. These have been reported as killing the caterpillars before maturity, but never in sufficient numbers to control an outbreak. The most important predators are insects and birds, although a few animals catch and eat both the caterpillars and adult moths. The most valuable insect predator is the fiery hunter or cutworm lion (*Calosoma* sp.). This is a heavy-bodied, active, black beetle with strong, pincer-like jaws. The larva of the beetle is also black and likewise equipped with strong jaws. Both adults and larvæ attack and eat the cutworms in the spring, but the beetles are also present in the fall at which time they catch many of the moths in hiding.



Fig. 3.—*Calosoma tepidum*; larva (cutworm lion) and adult beetle; natural size (after Strickland).

The value of birds in the control of insects is frequently exaggerated, although they do have a value in helping to reduce numbers. It happens that crows are migrating northward at a time when army cutworms are most plentiful and these are probably the most beneficial of the birds. The gull, ground sparrow, horned lark, blue bird and robin, not only feed on the cutworms, but also feed them to their young in the nests. The blue bird and king bird catch moths which are flying on cool afternoons.

### FORECASTING OUTBREAKS

The damage caused by army cutworms is largely due to the fact that outbreaks appear suddenly and catch the farmers totally unprepared. Advance notice of three or four months when an outbreak is expected should allow ample time for preparations for control programs and eliminate much of the loss. Because of the marked effect that weather has on the increase or decrease of the pest, it is possible by careful observation of the late summer and fall conditions to make a fairly accurate prediction as to what may be expected the following year.

A dry July followed by a wet fall is favourable to an increase of the insect, while the reverse of these conditions will result in a marked decrease. For all practical purposes it is safe to say that a July with less than one and one-half inches of rainfall followed by a total of more than four and one-half inches during August, September, and October, will result in an outbreak the next spring. On the other hand, if July has over one and one-half inches of rainfall and the other three months are fairly dry there will be little chance of trouble the following season.



## ARTIFICIAL CONTROL

There are two methods of control for the army cutworm which have been generally recommended. The first of these, poisoned bait, is economical and efficient as an actual control, while the second, a trap furrow, will effectively check a migration for a short time.

The poisoned bait consists of a carrier poisoned with some form of arsenic. Paris green has been used extensively; white arsenic is cheaper, although not as readily obtained.

The formula for the poisoned bait is as follows:—

Bran.. . . . .	100 pounds
Paris green or white arsenic.. . . . .	4 pounds
Salt.. . . . .	2 pounds
Molasses.. . . . .	2 gallons
Water.. . . . .	9 gallons

White arsenic or Paris green is very poisonous and in mixing the bait it is necessary to introduce the poison carefully to avoid filling the air with dust. If the dust is inhaled or if it settles on portions of the body where it is held by perspiration, serious burning may result. For these reasons it is best first to mix the two gallons of molasses with six or seven gallons of water; then add the salt and when this is thoroughly dissolved stir in the poison. As the poison is heavy and does not dissolve, the mixture should be stirred vigorously to prevent settling. It is then sprinkled over the bran, which is worked constantly until it is thoroughly soaked. If the mash is sticky and will not scatter freely more water should be added until a loose crumbly mash is formed, but one that is not sloppy.

The bait should be scattered broadcast as thinly as possible wherever the cutworms are present. If there is a general migration the bait should be applied at the front of the line of march, but if the cutworms are spread throughout the field the whole area must be treated. On bright, hot days the bait should not be scattered until late afternoon, as it will be less attractive if put out in the morning and allowed to dry during the day.

Trap furrows are used when the cutworms are migrating from one field to another. There are two types of trap furrows. One, the "straight-sided furrow", and the other, the "dusty-sided furrow." These furrows do not kill the cutworms and cannot be used as an absolute control, but they are very effective in checking a migration and concentrating the cutworms so that the maximum amount of good may be accomplished with a minimum amount of poisoned bait.

The straight-sided furrow is made with an ordinary mold board plow set to cut as deep a furrow as possible. A colter should be used to insure a straight clean cut and the furrow is made across the line of march with the straight side towards the field to be protected. The migrating cutworms crawling into the furrow have difficulty in climbing up the perpendicular side and their progress is thus effectively checked.

The dusty-sided furrow is made in a manner similar to the former except that the land is thrown out towards the crop to be protected. A log is then dragged through the furrow to pulverize the dirt at the sides and bottom. The fine dust on the side allows of no foothold for the migrating cutworms and they are trapped until the greater part of the dust has been worked to the bottom of the trench when the more solid soil exposed permits them to climb out of the furrow.

Both types of furrows need attention and repairing daily. The log must be dragged through the dusty furrow once or twice a day in dry weather to keep the side dusty. The straight-edged furrow needs trimming with a spade to remove irregularities and cave-ins. Both can be used as a place for poisoning the cutworms with the poisoned bait.

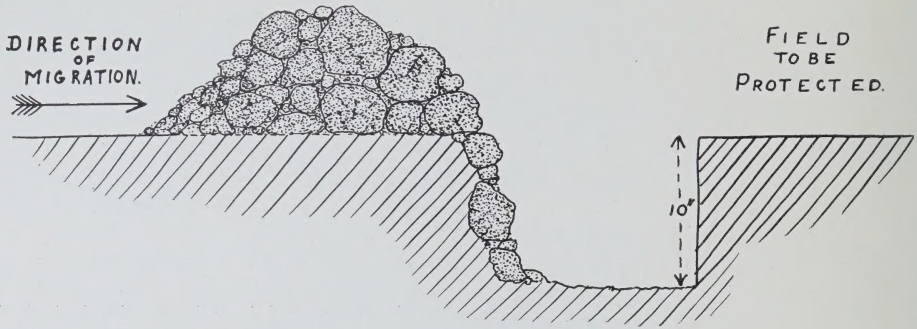


Fig. 4.—Diagram of vertical-sided furrow (after Strickland).

A very cheap and efficient bait for use in furrows can be made by poisoning stink weed or mustard. About fifty pounds of freshly pulled plants are thoroughly sprinkled with water and then, while the pile is turned with a fork, a pound of Paris green or white arsenic is dusted over it until there is a fairly even coating of poison on each leaf. The same result can be obtained by stirring the poison into the water with which the plants are sprinkled. The plants after poisoning are scattered along the bottom of the trap furrow at the rate of one plant to a foot of trench.

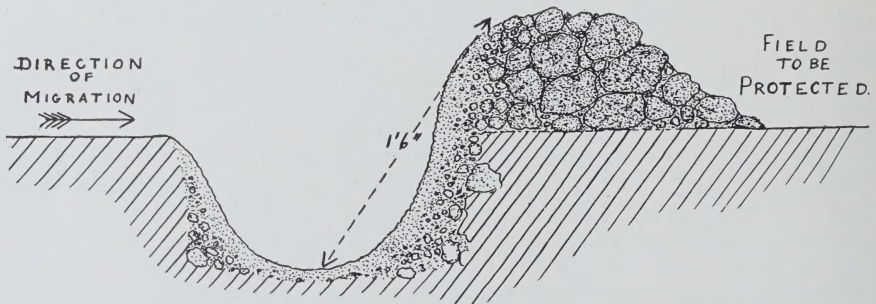


Fig. 5.—Diagram of dusty-sided furrow (after Strickland).

There have been many control measures tried by individuals who have reported apparent success. None of these have proven to be of any value under all conditions and are not recommended for general use.

Seed treatments with turpentine or kerosene have no effect in making the plant distasteful to the cutworms. As the cutworm does not touch the seed but feeds only on the plants, these treatments are useless and often injure the seed.

Rollers and packers have sometimes been used in an attempt to crush migrating worms. Unless the ground is very hard these merely push the cutworms into the soil without injuring enough of them to make the operation of value. A heavy drag will have more effect than a roller but the results accomplished do not warrant the expenditure of time, which can be better used in preparing furrows and scattering poisoned baits.



Spraying weeds along the edge of a field with Paris green or white arsenic at the rate of one pound to thirty gallons of water is effective if the vegetation is all weeds. If there is much grass mixed with these weeds the cutworms may move on without feeding until they reach the grain. Spraying the grain will kill the cutworms but they destroy the crops in getting the poison.



Fig. 6.—Preparing a dusty-sided furrow  
(after Strickland).



Fig. 7.—Applying poisoned stinkweed to the dusty-sided furrow (after Strickland).

## RESEEDING

When the army cutworms have destroyed a crop they move on to new feeding grounds. Therefore, it is safe to reseed a destroyed field as soon as the cutworms have left. The crop to be used in reseeding will depend on the season and, if it is too late to seed wheat then oats, flax or barley may be sown. In wet seasons, much of the wheat which has been cut by the army cutworm may recover, and it is well to wait a short time before reseeding, to determine the percentage of grain which is going to survive.







